The Johns Hopkins Hospital Bulletin.

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COURSES OF INSTRUCTION FOR GRADUATES IN MEDICINE, 1890-91.

During the year 1890–91, instruction will be given at the Johns Hopkins Hospital in Pathology and Bacteriology, Medicine, Surgery, Gynecology, Hygiene, Psychiatry, and Diseases of the Nervous System, by lectures, demonstrations, laboratory courses, bed-side teaching and general clinics in the laboratories, wards, dispensary, amphitheatre and private operating rooms.

1. PATHOLOGY AND BACTERIOLOGY.

The instruction in Pathology is under the charge of Dr. W. H. Welch, Pathologist to the Hospital and Professor of Pathology, Johns Hopkins University; and of Dr. W. T. Councilman, Assistant Pathologist to the Hospital, Associate in Pathology and Associate Professor of Anatomy, Johns Hopkins University. It is conducted in the Pathological Laboratory, which is one of the buildings of the Johns Hopkins Hospital, especially constructed for pathological work. Here are to be found an autopsy theatre, rooms for bacteriological and special research, rooms for pathological histology, experimental pathology and photography, and a museum.

Courses of instruction in Pathological Histology are continued throughout the entire year. The first course will begin in the early part of October, the second course in January. In connection with the course in pathological histology fresh pathological specimens are demonstrated and also studied microscopically, especially by the aid of frozen sections. Instruction is also given in the methods of making post-mortem examinations and of recording the same. Opportunity is afforded in connection with the course in pathological histology to become familiar with clinical microscopy by the examination of the urine, sputum, blood and various pathological fluids.

Much attention is given to the collection and study of material in Comparative Pathology.

The resources of the laboratory are open to those who are fitted to engage in special investigations in any department of pathology.

In addition, special courses of lectures on pathological subjects will be given during the months of January, February and March, 1891, in the clinical amphitheatre of the Johns Hopkins Hospital. Professor Welch at this time will lecture once a week upon selected subjects in Bacteriology, especial attention being given to the relation of bacteria to the infection of wounds.

Professor Councilman will lecture upon the Pathology of Bright's Disease. He will consider the etiology and pathological histology of Bright's Disease with especial regard to the classification of the different forms of nephritis.

The instruction in Bacteriology is under the charge of Professor W. H. Welch and of Dr. A. C. Abbott, Assistant in Bacteriology and Hygiene.

The rooms for bacteriological work are in the Pathological Laboratory. They are supplied with all of the apparatus required by modern bacteriological methods, such as those employed in the Hygienic Institute in Berlin. The laboratory has a full set of cultures of pathogenic micro-organisms, and of others useful for study and teaching.

Opportunities for studying bacteriology are available for students during the entire year, the laboratory being open on week days from nine o'clock in the morning until six in the evening. As much time can be given to the work as the student has at his disposal.

In the bacteriological course the student becomes familiar with the preparation of the various culture media, with the principles

and methods of sterilization, and with the morphological and biological characters of the micro-organisms which belong to this department of study, particularly with those which cause disease. The methods of making biological examinations of the air, water, and soil, are taught. Facilities are afforded to those who are prepared to undertake original investigations in bacteriology. During the months of January, February and March, Dr. Abbott will lecture upon "The historical development of bacteriology" and the "Development of modern views on immunity."

2. MEDICINE.

In this department of the Hospital, which is under the charge of Dr. Wm. Osler, Physician to the Hospital and Professor of Medicine, Johns Hopkins University, are comprised—

I. The Medical Wards.
II. The General Medical Dispensary.
III. The Special Dispensaries for Diseases of the Throat, Diseases of Children, and Diseases of the Nervous System.
IV. The Clinical Laboratories.

Instruction is here provided as follows:

I. Bed-side and Dispensary Teaching.

A limited number of graduates in medicine will be permitted to make the daily visit to the wards with Professor Osler and his assistants. They will receive instruction in the methods of case-taking, in physical diagnosis, and in the study of the action of medicine.

In the dispensary, which is also under the immediate charge of Professor Osler, the more important cases will be selected for study and demonstration.

II. Special Courses.

(*a*) In Laryngology, by Dr. J. N. Mackenzie.
(*b*) In Diseases of Children, by Dr. Osler and Dr. Booker.
(*c*) In Diseases of the Nervous System and in Electro-Therapeutics, by Dr. Osler and Dr. H. M. Thomas.

III. Lectures.

(*a*) Regular weekly clinics in the amphitheatre upon cases or groups of cases illustrating points in diagnosis or treatment.
(*b*) A course of six or more lectures on Valvular Diseases of the Heart, to be delivered during January and February, 1891, in the amphitheatre.
(*c*) A course of three lectures on the Practical Aspects of Cerebral Localization, to be delivered during March, 1891.
(*d*) A course of twelve lectures by Dr. H. M. Thomas on the Application of Electricity in the diagnosis and treatment of nervous disorders, also upon Diseases of the Nervous System, to be delivered in January, February and March, 1891.

IV. Laboratory Courses.

The clinical laboratory, which is adjacent to the wards, consists of four rooms provided with chemical, microscopical, and clinical apparatus. With Dr. Lafleur, Resident Physician, courses will be given in

(*a*) Clinical Microscopy.
(*b*) Clinical Urinology.

Opportunities will also be given to advanced students to pursue special lines of work in medicine or therapeutics.

3. SURGERY.

The department of surgery in the Hospital is under the charge of Dr. W. S. Halsted, Surgeon to the Hospital and Associate Professor of Surgery, Johns Hopkins University.

Surgical instruction will be given in the

I. Wards.
II. Amphitheatre.
III. Private Operating Room.
IV. Dispensary.

I. Wards.

Bed-side teaching in general surgery will be given by Dr. Halsted and the Resident Surgeon, to a selected number of graduates in medicine, from October, 1890, to June, 1891.

II. Amphitheatre.

Didactic and clinical lectures will be given in January, February and March, 1891, by Dr. Halsted.

(The subjects of these lectures will be announced later.)

III. Private Operating Room.

Operations will be made here by Dr. Halsted daily, except Sunday, from 8–11 a. m. The privileges of this room will be extended to a selected number of graduates in medicine, from October, 1890, to June, 1891.

IV. Dispensary.

Opportunities will be afforded here to graduates in medicine to do practical work from October, 1890, to June, 1891, in the following:

(1) General Surgery, under the supervision of Drs. Halsted and Finney.
(2) Genito-Urinary Surgery, under the supervision of Drs. Halsted and Brown.
(3) Ophthalmology and Otology, under the supervision of Drs. Theobald and Randolph.
(4) Dermatology, under the supervision of Dr. Morison.

4. GYNECOLOGY.

The department of gynecology in the Hospital is under the charge of Dr. H. A. Kelly, Gynecologist and Obstetrician to the Hospital, and Associate Professor of Gynecology, Johns Hopkins University. It comprises:

I. The Wards.
II. The Private Operating Room.
III. The Dispensary.

Instruction will be given by Dr. Kelly and Dr. H. Robb, Assistant in Gynecology, according to the following plan:

I. Practical Work.

(1) The operations upon cases admitted to the wards for perineal, vaginal, vesical, uterine, tubal and ovarian diseases will be used for purposes of instruction either in the weekly clinics or at the bed-side.
(2) Instruction will be given in the wards upon the after-treatment of cases which have been operated upon, their management during the period immediately

following the operation and throughout the period of convalescence.

(3) The dispensary will be used daily to a limited extent for instruction in the diagnosis of pelvic disease with special reference to bi-manual methods of examination.

(4) Private operating room. The privileges of this room to see operations by Dr. Kelly will be extended to a limited number of graduates in medicine. Operations will be made daily, except Sunday, at 9 a. m.

II. LECTURES.

A course of twelve lectures by Dr. Kelly will be given in January, February and March, 1891, as follows:

Five lectures on Plastic Operations for Injuries consequent upon Parturition.

(1) Laceration of the cervix.
(2) Vesico-vaginal fistula.
(3) Laceration of the perineum, complete and partial.
(4) Relaxation of the vaginal outlet, cystocele and rectocele.
(5) Prolapsus uteri.
(6) One lecture on catheterization of the ureters.
(7) One lecture on displacements of the uterus and their treatment.

Five Lectures on Abdominal Surgery.

(8) History taking; methods of examining and detecting pelvic diseases.
(9) Extra-uterine pregnancy.
(10) Ovariotomy.
(11) Pelvic abscess.
(12) The after-treatment of abdominal cases.

III. CLINICS.

A regular weekly clinic in diseases of women will be given in the amphitheatre from October to May.

5. HYGIENE.

This department is under the charge of Dr. John S. Billings, Surgeon U. S. Army and Lecturer on Hygiene, Johns Hopkins University; assisted by Dr. A. C. Abbott. The course of instruction will consist of didactic lectures by Dr. Billings, and practical work in the hygienic laboratory, by Dr. Billings and Dr. Abbott.

I. LECTURES.

A course of lectures will be given by Dr. Billings during April, to advanced students in hygiene and vital statistics.

II. PRACTICAL COURSES.

These will consist of familiar lectures, and demonstrations and practical work by students. They will comprise physical, chemical, and bacteriological investigations of the air; methods of ventilation and heating; physical, chemical, bacteriological, and general investigations of water; investigations as to the healthfulness of building sites, with reference to vegetation, soil, ground-air, ground-water, ground-temperature, and moisture and organic impurities; the study of ferments and disease-producing micro-organisms; the practical study of methods of sterilization and disinfection; the study of foods, clothing, habitations, etc.

The practical courses in the hygienic laboratory will extend over three months, and will commence in March, 1890.

6. PSYCHIATRY.

LECTURES.

A course of didactic lectures for graduates in medicine will be given by Dr. Hurd, Superintendent of the Hospital and Professor of Psychiatry, Johns Hopkins University, during January, February and March, upon Insanity in its clinical aspects.

FEES.

Graduates of Medical Colleges may be admitted to all of the above-mentioned courses for the sum of $100.

The charge for all courses in Pathology and Bacteriology is,	$50.
For either course,	25.
For all courses in Medicine,	50.
For either course,	25.
For all courses in Surgery,	50.
For either course,	25.
For all courses in Gynecology,	50.
For either course,	25.
For all courses in Hygiene,	50.

These fees will include all lectures and clinics in the special departments for which payment has been made.

Graduates in medicine who desire to attend the didactic lectures only, may do so by paying a proportionate fee. Such attendants upon lectures are not entitled to special courses of instruction without further payment. Graduates in medicine, resident in Baltimore, will be admitted *without charge* to the lectures and clinics in the amphitheatre by registering at the office of the Hospital and obtaining a ticket of admission.

REGULATIONS.

These courses of instruction in Medicine, Surgery, and Gynecology are open only to graduates in medicine, who must give satisfactory evidence to the officers of the Hospital that they are fitted to profit by the courses.

The courses in Pathology, Bacteriology and Hygiene are open to graduates in medicine and advanced students in biology.

Letters of inquiry may be addressed to the

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THE TREATMENT OF YELLOW FEVER WITH SODIUM BICARBONATE AND MERCURIC CHLORIDE.

By GEORGE M. STERNBERG, M. D., *Major and Surgeon, U. S. A., Fellow by Courtesy in Johns Hopkins University.*

In the summer of 1888, while in Cuba pursuing investigations relating to the etiology of yellow fever, the writer ventured to suggest a mode of treatment based upon his views as to the *modus operandi* of the specific infectious agent.

The object of the present paper is to give a summary of the results which have been reported to me up to the present date by those physicians who have given this treatment a trial.

I will not at present enter into a discussion of the various modes of treatment which have been employed in this disease, or of the special reasons which induced me to propose the treatment now under consideration. I may remark, however, that a majority of the physicians who have had much experience in this disease agree that active medication, as a rule, does more harm than good, and that the best results are obtained by a simple "expectant treatment," with careful nursing. This was also my conviction up to the time that I suggested, on theoretical grounds, the administration of sodium bicarbonate in full doses throughout the febrile stage of the disease, together with minute doses of mercuric chloride.

My main object was to neutralize the acidity of the secretions, and thus to prevent vomiting and promote diuresis; and I hoped that the mercuric chloride might be of use in restraining the development of micro-organisms in the stomach. The formula, as first prescribed, was:

℞ Bicarbonate of soda, grams x. (150 grains).
Bichloride of mercury, centigrams ij. ($\frac{1}{3}$ gr.).
Pure water, litre j. (1 quart).

M. Sig.—50 grams (3 tablespoonfuls) every hour; to be given ice cold.

The quantity of bicarbonate of soda has been increased to xv grams by some of those who have employed the treatment, and apparently with advantage.

In order that a judgment may be formed as to the probable influence of this treatment upon yellow fever mortality I give below the data at hand with reference to the mortality from this disease at different times and in different places, quoting from an article by myself in Wood's Reference Handbook of Medicine.

"Mortality: The mortality from yellow fever varies greatly in different epidemics and among different classes of the community.

"Among the natives of cities in which the disease is endemic, or in which it has frequently prevailed as an epidemic, it may be as low as from seven to ten per cent. One reason for this comparatively small mortality, is found in the fact that a considerable proportion of the cases in such a community are among children. Among unacclimated adults the mortality ranges from twenty to sixty per cent. and under certain circumstances even exceeds the latter figure. In the great Philadelphia epidemics of the last, and the beginning of the present century, the mortality was from twenty to eighty per cent. In the French Antilles, according to Dutrouleau, the mortality during the years 1851 to 1857, inclusive, ranged from 12.9 per cent. to 50 per cent. Blair gives the mortality at the Seamen's Hospital at Georgetown (Demerara) in 1838 at 19.5 per cent.

"At Vera Cruz the mortality for seven years (1875–1881), according to Dr. Molina's statistics, was 41.78 per cent. in the hospital for men, and 41 per cent. in the hospital for women. In Rio Janeiro the mortality for the year 1870 was 17.4 per cent. In the epidemic of 1873 it was 23.3 per cent.

"The mortality among the Spanish troops in Cuba, according to the statistics of Dr. Bastarreche, was, in the year 1855, 24.31 per cent., and in the royal navy 17.8 per cent.

"Dr. Bemiss gives the mortality rate for the city of New Orleans, during the great epidemic of 1878, as 16.66 per cent."

In the last epidemic in which I have been personally responsible for the care of the sick, at Fort Barrancas, Fla., in 1875, I avoided active medication, with the exception of a mild purgative at the outset of the attack, and endeavored to secure for the sick the best possible attention. But under this "expectant treatment" and very favorable surroundings the mortality exceeded 39 per cent. Total cases 74, total deaths 29. Percentage of mortality 39.2.

At the Pensacola Navy Yard during the previous year (1874) the mortality was:

Officers	13 cases,	6 deaths.
Officers' families	20 "	5 "
Marines and sailors	31 "	11 "
Total	64 "	22 "

Percentage of mortality, 34.37.

I proceed now to present, in tabular form, the results, as reported to me by a number of different physicians in different localities of the mode of treatment to which this paper specially refers.

Locality.	Year.	Reported by.	Whites.			Colored.		
			Cases.	Deaths.	Per Cent.	Cases.	Deaths.	Per Cent.
Decatur, Ala.	1888	Dr. B. F. Cross.	20	2		4	0	0
" "	1888	Dr. E. J. Conyngton.	8	1		3	0	0
" "	1888	Dr. F. M. Littlejohn.	3	0		16	0	0
" "	1888	Dr. W. C. Buckley.	1	1		9	0	0
		Total, . . .	32	4	12.5	32	0	0
Jacksonville, Fla.	1888	Dr. Solliace Mitchell.	79	5	6.3	27	0	
"	1888	Dr. A. J. Wakefield.	75	5	6.6	14	0	
Rio de Janeiro.	1889	Dr. R. Cleary.	34	1	2.9			
Havana.	1888	Dr. Raphael Weiss.	12	0	0			
"	1889	Dr. D. L. Burgess.	25	0	0			
"	1889	Drs. de la Guardia and Martinez.	44	7	15.9			
		Total, . . .	301	22	7.3	73	0	0

The general mortality in the epidemic at Decatur, Ala., has been given to me by the State health officer as follows:

Whites: Cases, 97; Deaths, 30; Mortality, 30.92 per cent.
Colored: Cases, 57; Deaths, 5; Mortality, 8.77 per cent.

But a just comparison requires that we deduct the number treated by the method under investigation from the total number of cases occurring during the epidemic. This leaves us 65 whites with 26 deaths, and 25 colored with 5 deaths, treated by other methods, and gives a mortality of 40 per cent. among the white and 20 per cent. among the colored population;

whereas, under the alkaline and bichloride treatment the mortality was reduced among the whites to 12.5 per cent., and not a single death occurred among the colored population.

No exact statistics have been published, so far as I am aware, with reference to the Jacksonville epidemic, but Dr. Mitchell has estimated the mortality among the white population at from 22 to 25 per cent.; while among the 79 whites treated by him, by this method, in the Sand Hills Hospital, the mortality was 6.3 per cent. This is much below the average for the whole population, a majority of which was colored.

Dr. Cleary's cases in Rio de Janeiro were for the most part unacclimated Americans and his success is certainly remarkable, as the epidemic during which they occurred is the most fatal one which has visited the city of Rio for a number of years.

The last figures in our table relate to cases treated in the Charity Hospital of Havana by Dr. D. Vincente de la Guardia and Dr. Emilio Martinez. The author of the paper in which these figures are published has given the following tabular statement of the results obtained in the same hospital during seven years preceding the year 1889, in which this treatment was adopted.

"The official statistics of yellow fever in the Mercedes Hospital in previous years is as follows:

YEAR.	TREATED.	RECOVERED.	DIED.	MORTALITY.
1882	187	124	63	33.6 per cent.
1883	178	103	75	42.1 "
1884	132	77	55	41.6 "
1885	40	16	24	60.0 "
1886	28	11	17	60.7 "
1887	75	33	42	56.0 "
1888	72	38	34	47.2 "
Total:	712	402	310	43.5 per cent.

"From the comparison made it appears that the Sternberg treatment has diminished the mortality to less than one-half the mean mortality of this hospital" (15.9 per cent.).

STOMACH WASHING IN CHILDREN.

By WM. D. BOOKER, M. D., *Assistant in Diseases of Children, Johns Hopkins Hospital and Dispensary.*

The application of mechanical treatment to the stomach is not of recent origin. In 1659 Fabricius used a rude brush for removing the tough mucus from the stomach, an operation frequently resorted to, at that time, especially after a debauch.

In the latter part of the past century Hunter introduced the hollow sound for injecting irritating substances into the stomach and in 1822 Bush added the suction pump for emptying the stomach after opium poisoning. The danger in the use of force in emptying the stomach led Arnott in 1829 to propose stomach siphoning, which was practised for a short time but soon fell into disuse, and was forgotten until 1867 when it was revived by Kussmaul. A few years later Leube applied the stomach tube to diagnostic purposes, and thus opened a new way of investigating the stomach. The apparatus was still imperfect and safe only in experienced hands, as it was considered necessary to stiffen the tube with a stylet or mandarin.

This defect was overcome in 1875 by Ewald partly through accident. The ordinary instrument could not be found in a case of emergency when a stomach tube was improvised out of a rubber gas tube and it was found that this could be easily introduced without a guiding rod. This discovery rendered the operation almost entirely free from danger, and it soon began to attract a wide interest and study in the range of its advantages and possibilities.

The stimulus thus given to the study of stomach disorders has been directed rather to finding reliable reagent tests than in following the more exact method of chemical analysis, which is simply out of the question for physicians. The reagent tests are subject to fallacies and their sensitiveness is affected by different constituents of the stomach contents, but the sources of error and the means for avoiding them are gradually becoming known, and by combining a number of tests, fairly reliable results may often be obtained.

Although many of these reagents are sensitive to a very minute quantity of the substance to be tested their action is more decided when a larger proportion is present. For this reason it is desirable to have the stomach contents in a concentrated form which may be accomplished by expression. When the tube enters the stomach and before any water has been poured into it, a contraction usually occurs, expelling the stomach contents through the tube. If this does not happen, voluntary efforts of vomiting or coughing generally succeed for adults, and in children a contraction may be produced by gently twisting the tube in the stomach.

As the stomach secretes more abundantly after full than light diet a uniform practice should be observed. For this, various proof-meals have been recommended. The proof-breakfast of Ewald, consisting of a slice of dry wheat bread and a cup of weak tea, is the simplest and most cleanly.

The stomach contents may be expressed at different intervals after giving the proof-meal and collected in a clean vessel for examination. An estimate of the rate and strength of digestion may be formed by noting the quantity and condition of the contents returned.

It is desirable to know if the contents be acid, the nature of the acid and the degree of acidity. For this purpose the stomach contents should be filtered before applying the reagent tests. Litmus will decide if an acid be present, but will not distinguish free acids from one another nor from acid salts. Tropæolin and congo-red are the most reliable tests for free acids. Tropæolin gives a dark-brown color with free acids, a straw-yellow with acid salts. Congo-red gives a sky blue color with free acids, and no reaction with acid salts. To determine the nature of the free acid other tests are needed. For hydrochloric acid phloroglucen vanillin is considered most reliable, and for lactic acid Uffelmann's test, composed of the tincture of the chloride of iron and carbolic acid. Acetic and butyric acids are generally recognized by their odor.

If tropæolin and congo-red give the reaction for free acids and phloroglucen vanillin the characteristic red lines for hydrochloric acid, this may be considered positive evidence of the presence of free hydrochloric acid. A negative reaction, however, does not necessarily indicate the absence of the acid.

The presence of peptones, rennet ferment, and the strength of peptic digestion are determined by the tests given in the text-books on physiology.

INTRODUCTION OF STOMACH WASHING IN CHILDREN.

In 1880 Epstein introduced stomach washing in the treatment of the digestive disorders of children, in consequence of the frequent occurrence of vomiting in these disorders, the fact that vomiting often precedes the diarrhœa, and the extension of catarrh with increase of symptoms from above downwards.

In 1873 he published his experience by this method founded upon the treatment of 286 children ranging from two days to nine months of age. It was fortunate for the early adoption of this treatment that it was first advocated by one not only careful in his observations and minute in all the details of the operation, but also thoroughly conservative in his statements.

With proper precautions stomach washing in children is almost entirely free from danger, and is more easily performed in infants than in adults. Great difference is manifested in children in the degree of sensitiveness to the tube. Some will suck it like a nipple while others show more or less discomfort during the whole operation. As a rule, the younger the child the better it is borne, which is attributed by Epstein not only to less active reaction, but also to the fact that in very young children reflex excitability is less than is generally supposed.

METHOD OF STOMACH WASHING IN CHILDREN.

The apparatus now in use is the one originally recommended by Epstein. A soft Nelaton's catheter, Nos. 8, 9, 10, attached by a short glass tube to a common rubber tube two feet long with a two ounce glass funnel fitted into

the distal end. A pitcher containing a half gallon of tepid water is placed in a convenient position for handling, and in some cases it is of advantage to add a teaspoonful of equal parts of bicarbonate and benzoate of soda to the water.

The child is held in a sitting position in the nurse's lap with the head slightly bent forward, and hands confined by the left arm of the nurse across its chest. Tight clothing on the child is loosened and a rubber bib is fitted closely around the neck, extending over the front to the basin on the floor. The nurse's lap should also be protected with a rubber cloth.

The tube is moistened with water, inserted into the mouth, passed back to the pharynx and directed downwards into the œsophagus and stomach without interruption.

Gagging or retching and even vomiting may occur, especially in children with sensitive stomachs, and when the introduction of the tube is delayed at the pharynx, by rubbing against the root of the tongue and soft palate. Usually the gagging ceases when the tube enters the stomach, but if it does not, the tube should be drawn up a little and carried to one corner of the mouth. It is unnecessary to depress the tongue with the finger, and as this is apt to cause gagging it should be avoided. With a little experience it is easy to tell when the tube enters the stomach. A contraction generally occurs expelling the stomach contents, if any, through the tube, and if fermentation is going on, the entrance of the tube into the stomach is accompanied with an audible escape of gas.

After collecting the concentrated stomach contents for examination, the nurse holds the tube in position, taking hold of it close to the child's mouth with the right hand. From one ounce to two ounces of water is poured from the pitcher into the funnel held above the level of the child's head, and as the last of the water runs from the funnel, the stomach contents are siphoned by lowering the funnel to the basin on the floor.

By holding the bowl of the funnel up instead of down, the return fluid may be collected in the funnel and its quantity and character noted. When the flow from the stomach ceases the funnel is emptied, rinsed out and again filled with water which is allowed to run into the stomach as before. This process is repeated until the water returns from the stomach clear, usually requiring from a quart to a gallon of water. The funnel should be filled as soon as emptied to avoid too much air entering the stomach.

The inflow of water through the tube may be interrupted by pressure upon the tube from the child holding its breath too long, continued crying, vomiting or coughing. The outflow may be hindered by pressure on the tube, by occlusion of the eye of the tube with mucus, milk curds or other contents of the stomach. Sometimes the tube may be inserted too deep and bending on itself in the stomach raise the eye above the contents. If the outflow ceases the tube should be withdrawn a little and if this does not succeed, it should be taken out, cleansed and reintroduced.

If the stomach contains a great quantity of thick curds vomiting may be produced by filling the stomach with a large quantity of water. There is a possible danger of suction pneumonia if vomiting occurs when the tube is in the stomach, and it is recommended to withdraw the tube until the vomiting ceases. There is no danger of the tube passing into the larynx, nor of perforating the stomach. On the dead body of a four weeks old atrophic child, with very thin stomach wall, Epstein could not succeed in perforating the stomach with the soft catheter, nor in injuring the mucosa, even after repeated efforts.

Physiological Digestion.

The use of the stomach tube may be considered from three standpoints. 1. Study of physiological digestion. 2. The deviations in disordered digestion. 3. As a therapeutic measure.

In children stomach washing is restricted to the age of infancy, or to those under 2½ years of age. Older children cannot be persuaded or controlled, and the resistance they offer overcomes the advantage to be gained.

The study of digestion in children by means of the stomach tube, then, is mainly the study of milk digestion. The importance of this study cannot be overestimated when we consider the great mortality and serious impairment to development occasioned by the digestive disorders in infants. And with the simple and almost harmless method of obtaining the gastric contents at any stage of digestion we may reasonably hope for a great advance in our knowledge on this subject. Much has been accomplished already, mainly through the investigations of Epstein, Leo and Escherich, who have examined the stomach contents of a large number of sucklings with normal as well as abnormal digestion.

As a result of these investigations it appears that milk remains in the stomach of infants a shorter time proportionately than in adults. The time required for all the milk to disappear from the stomach depends chiefly upon the age of the child, and the nature and quantity of the milk. In breast-fed children during the first week the stomach is frequently empty after one hour, in older children and those using cows' milk a longer time is required. One and a half hours may be considered a maximum time for breast children during the first month and two hours for older children and those fed on cows' milk.

As to how long milk remains in the stomach before a part of it passes out, that is, whether such movement takes places continuously or periodically in great quantity, no conclusions were reached. However, after half an hour a considerable quantity of milk has disappeared from the stomach.

The reaction of the stomach contents immediately after nursing varies according to the reaction of the milk taken into the stomach. In mothers' milk it is alkaline, amphoteric or neutral; in cows' milk amphoteric, neutral or slightly acid. After fifteen minutes it is always acid and the degree of acidity gradually increases. Free acid only appears after a long time—generally it is not found an hour after nursing. It does not follow from this that free hydrochloric acid is not secreted at this time, but that it is secreted gradually and combines with the lime salts of the milk as rapidly as it is secreted. This chemical reaction continues as long as any uncombined lime salts are present. It is only after they have all been converted into their compounds with hydrochloric acid, that we find the acid free in the stomach. Almost without exception free hydrochloric acid has been found in the empty or fasting stomach. This, however, does not indicate a continuous secretion, but the remnants of that secreted during the digestion of the last meal. Milk absorbs a considerable quantity of hydrochloric acid, and according to Escherich cows' milk takes up much more than human milk.

The addition of 8–9 cc. of ¼ normal hydrochloric acid solution to 50 cc. of mothers' milk is sufficient to show free hydrochloric acid; while 15–16 cc. is necessary for the same amount of cows' milk.

Leo examined two new-born children two and three hours after birth and before food was taken. In both the stomach contained a considerable quantity of amniotic fluid. While normally this fluid is alkaline that obtained from the two stomachs was strongly acid. Neither volatile or lactic acid was found. This confirms the opinion of Zweifel that hydrochloric acid is found in the gastric mucous membrane of the fœtus and the new-born. Rennet ferment was always found in the stomach contents of the new-born as well as in older children, and often in sufficient quantity to coagulate milk in a few minutes in the room temperature, yet the rennet ferment is much less in children than in adults.

A digestive ferment for albumen is always found in the empty as in the full stomach, but hydrochloric acid must be added to dissolve cooked fibrin. There is a manifest increase of I and II propeptones (Hoppe-Seyler) half an hour after milk has been taken into the stomach, but peptone is only present in a small quantity at this period; after an hour it has increased.

There is a slight if not considerable peptonization of milk in the stomach, but Leo regards the peptonization of milk in the stomach of inconsiderable importance and is inclined to regard the stomach as a reservoir for the intestine where the chief digestion takes place.

Pathological or Disordered Digestion.

In gastric catarrh milk remains much longer in the stomach than in the healthy condition. Milk curds are washed out four or five hours or even longer after nursing, and in one case Epstein found at his morning visit a perceptible quantity of curds, although the child had taken nothing into the stomach since the evening before. As infants seldom go five hours without being fed, it is probable that in retarded digestion the stomach is seldom or never empty.

Hypersecretion of mucus frequently accompanies retarded digestion, especially in chronic gastric catarrh. Thick layers of whitish or pale gray mucus cover the curds, or appear in thick lumps or ropes. When milk is retained a long time in the stomach the curds are firm and tough, and have an acid and often offensive odor.

A microscopical examination of the stomach contents shows the morphological elements of milk, various micro-organisms and sometimes epithelial and pus cells. As the micro-organisms and the cellular elements may be derived from swallowed expectoration, these sources of error must be excluded before attaching importance to their presence.

It is of great interest to know whether the stomach contains a constant bacterial vegetation, and whether there is a variation of the bacterial vegetation in healthy and disordered digestion, and also the relation of bacteria to gastric digestion in infants.

With a view to the study of these questions, I commenced during the past winter to examine the stomach contents of the children in whom stomach washing was practiced in the Dispensary.

The plan of the work consisted in obtaining the stomach contents in a concentrated form by expression, making cultures and coverslip preparations from the expressed contents; filtering the contents aseptically through porcelain and studying the effect of the filtrate upon sterilized milk alone and when inoculated with bacteria; and in testing the contents by different reagents.

The apparatus for stomach washing was steeped in scalding water for some time, both before and after being introduced into the stomach, and the expressed contents were collected in sterilized test tubes.

Before trustworthy conclusions can be drawn from such a work it will be necessary to examine the stomach contents of a large number of infants of different ages with normal and abnormal digestion, and the stomach contents must be obtained at different stages of digestion and in the intervals when the stomach is empty.

The number of cases which I have examined is limited to twenty, and none of these was kept under observation sufficiently long to make the examination complete. Still certain interesting observations have been made, and in stating them it is with the understanding that they are merely preliminary statements, subject to correction by further investigation.

Two of the children from whom the stomach contents were taken for examination were over two years of age, one being 2½, the other 3½ years. The other children ranged from two months to two years. All were effected with digestive disorder, in some the disturbance was very slight and without impairment of nutrition, in others it was more serious, and in two there was an extreme degree of innutrition. Three of the children had been fed on a mixed diet, the others chiefly on milk.

The small number of bacteria seen in coverslip preparations from the stomach contents affords a most striking contrast to the enormous number of bacteria in the feces. In some cases several fields were examined before finding a single bacterium. The forms of bacteria found varied considerably, forms resembling *bacterium lactis aërogenes, bacterium coli commune, sarcina* and large fungi frequently appeared. A chain coccus was found in many cases; it resembled a form which I have frequently seen in the diarrhœal feces, but have never succeeded in cultivating. Various other forms of bacteria were occasionally seen. In only one case were the bacteria at all numerous and in this case they were probably derived from the swallowed expectoration.

Cultures from the stomach contents were even more striking than the coverslip preparations. In some cases they were entirely negative. In the child 2½ years of age, fed on a mixed diet and with free hydrochloric acid in the stomach contents, there was a pure culture of *oidium lactis* and not a single colony of bacteria. Cultures were made from this case on three different days and each time with the same results. Cultures from the child 3½ years old, which had free hydrochloric acid in the stomach contents were entirely negative.

In a child seven months old having diarrhœa with occasional vomiting, retarded digestion, restlessness, fretfulness and emaciation, stomach washing was practised for two weeks. Cultures made the first day contained almost a pure culture of orange sarcina, while those made a few days later contained no sarcina and only a few colonies of the colon bacterium.

Free hydrochloric acid was found in only three cases, in two children over two years of age and in one six months old. Free lactic acid was not found in any case.

Action of the Aseptic Filtrate upon Milk.

The filtrate from the stomach contents of each child was added in nearly the same quantity to three sets of milk tubes. No. 1 contained uncooked fresh milk, No. 2 sterilized milk, No. 3 sterilized milk freshly inoculated with pure cultures from three to six varieties of bacteria previously isolated from the diarrhœal feces.

The filtrate from every case except one produced coagulation of the milk after remaining a while in the thermostat. The coagulum resembled the uniform soft or gelatinous coagulation of rennet ferment. The coagulation occurred soonest in the uncooked milk.

In all the tubes after coagulation occurred, liquefaction commenced and two layers appeared, a top layer of clear fluid and a lower layer of coagulum. In the tubes with uncooked milk, liquefaction was much more rapid and complete. In some cases the greater part of the coagulum liquefied in 12 to 20 hours in the thermostat. A small hard clot remained which never liquefied. As the milk was not sterilized in this set of tubes the action of bacteria could not be entirely excluded. In the second set of tubes containing sterilized milk and the aseptic filtrate, the coagulation and subsequent liquefaction was slower, and the coagulum remaining was always much larger than in the uncooked milk. The third set of tubes prepared as the second and then inoculated with bacteria showed a great difference. Instead of the soft gelatinous coagulum, there was a hard leathery clot perforated with canals and large caverns from fermentation, and the subsequent liquefaction was retarded.

Therapeutic Effect of Stomach Washing in Children.

Stomach washing has not been employed a sufficient length of time, nor by a sufficient number of physicians, to justify a proper estimate of its value. As a rule, those who have used it most are more impressed with its value, while others who have tried it in but few cases, or not at all, can only see in it an unnecessary trouble or even a positive injury.

My experience with stomach washing in children is based upon its use in 150 cases of gastro-intestinal disturbance at the Thomas Wilson Sanitarium during the past summer, and 40–50 cases at this Dispensary since that time. From the result of this experience I believe that stomach washing is of undoubted advantage in the treatment of the digestive disorders of infants.

It proved the quickest and most effective means for the relief of vomiting. In the great majority of cases vomiting was promptly relieved after the first washing, and in only one case was it found necessary to stop milk food before vomiting was checked. Vomiting occurring in serious dysentery was effected to a less extent by stomach washing, but in these cases benefit sometimes followed its use.

In summer diarrhœa there is more or less gastric disturbance, especially retarded digestion, even when there is no vomiting, and milk curds accumulate from a number of feedings, so that the stomach is seldom if ever empty. The removal of these curds not only prevents their passage into the intestine as a source of irritation and fermentation, but gives the stomach an opportunity to rest, and relieves the restlessness and depression so often dependent upon the presence of milk curds in the stomach.

The number of stools gradually diminished in most cases; and in acute cases, or in those of short duration, stomach washing generally afforded complete relief without any other treatment than attention to diet and cleanliness. In many cases, however, stomach washing was disappointing. In these improvement often followed the first washing, and afterwards gave no further benefit.

Constipation dependent upon a catarrhal condition of the gastro-intestinal tract may sometimes be entirely relieved by stomach washing. A child eleven weeks old was brought to the Dispensary last fall. It was feeble, thin, fretful and had not grown at all since the second week, and seldom had a natural stool. Generally it had long spells of constipation alternating with attacks of diarrhœa.

Stomach washing was practised daily for two weeks, when the bowels were moved regularly once or twice daily, fretfulness had disappeared and the child was stronger and commenced to grow.

Stomach washing is also of great advantage in cases of acute poisoning. A good illustration of this occurred in the Dispensary during the past winter. A child about three years old was brought to the Dispensary within a few moments after swallowing an unknown quantity of carbolic acid, in a state of unconsciousness and collapse. The stomach was thoroughly washed out by Dr. Finney, and almost as soon as the operation was completed the child became conscious, the radial pulse appeared and a good recovery followed.

Contraindications.

Stomach washing is contraindicated in children affected with heart disease, serious bronchitis and pulmonary trouble. When the tube continues to excite vomiting and strong resistance it is doubtful if advantage follows its use. A feeble condition of the infant does not necessarily contraindicate stomach washing, but often the opposite.

REPORT OF DR. WELCH'S REMARKS AND EXHIBITION OF SPECIMENS OF ANIMAL PARASITES AT THE MEETING OF THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY, ON MARCH 17TH, 1890.

Dr. William H. Welch exhibited gross and microscopical specimens of *entozoa* which he had found in domestic animals in Baltimore. These parasites had been collected during the last two years as opportunity offered, no attempt having been made to have the collection complete. Dr. Welch said that the interest in animal parasites had been overshadowed of late years by the study of the pathogenic bacteria, but nevertheless the entozoa are of great interest and importance and deserve our careful attention.

The following is a list of the parasites exhibited, all of which were found in Baltimore:

1. FROM THE HORSE:

Spiroptera Megastoma (or *Filaria Megastoma*). Stomachs were exhibited showing the honey-combed submucous tumors, with ulcerated mucosa, containing the large-mouthed maw-worms. This parasite is not very rare in the horses of this region, but in none of the cases in which it was found by Dr. Welch was there evidence that it had materially damaged the usefulness of the animal.

Strongylus Armatus. Several specimens, gross and microscopical, of verminous aneurism of the anterior mesenteric artery were shown. The interesting histological changes caused by the presence of the palisade worms in the blood-vessels were explained and illustrated by microscopical sections. This parasite with the resulting aneurisms is common in the horses of this region. In one instance it had caused fatal colic.

Gastrophilus Equi. A stomach, the mucous membrane of which near the cardia was completely covered with bots, was presented.

2. FROM THE COW:

Actinomyces Bovis. Although this is a vegetable parasite, the opportunity was taken to show a number of specimens of actinomycotic tumors from the jaws and other parts of the cow. On account of the absence of any satisfactory laws regulating the inspection of meat in this State, the number of cattle affected with actinomyces brought to Baltimore and slaughtered here for the market is unusually large and there is rarely any difficulty in procuring specimens of this disease. Attempts had been made to cultivate the organisms according to the directions given by Boström but without success. No instance in which the actinomyces had been found in human beings in Baltimore has been recorded.

Cysticercus Taeniae Mediocanellatae—found once in heart-muscle of cow.

Strongylus Micrurus. A number of cases of verminous bronchitis and pneumonia in calves due to this parasite had been observed and microscopical sections of lungs so affected were shown.

Filaria Labiato-papillosa (Alessandrini). This worm was found free on the peritoneal surface of a cow without causing any apparent injury.

3. FROM THE SHEEP:

Taenia Expansa—found in the small intestine. *Common.*

Strongylus Contortus—found in large numbers in the stomach of several sheep which had died at Druid Hill Park without other apparent cause of death.

4. FROM THE HOG:

Echinococcus. Echinococci were found in several hogs which had been born and reared in the neighborhood of Baltimore, but this parasite is not common in this region. Sections of liver were shown illustrating every stage of development of this bladder-worm from cysts smaller than a pea up to cysts as large as an orange. The taenia echinococcus produced by feeding the cystic worms to a dog was shown.

Cysticercus Cellulosae. The pork-measle had been found in only a few instances.

Echinorhynchus Gigas. This worm is common in the swine of this region and appears to be common throughout the United States. The ulcerated and necrotic patches in the inner wall of the small intestine caused by the attachment of the thorn-headed worm, bear some resemblance to the necrotic foci resulting from hog cholera. In only one instance had the gut been actually perforated by this worm.

Trico-cephalus Crenatus—very common in the coecum.

Ascaris Suilla, believed by many to be identical with the ascaris lumbricoides, was not very often met with. In one case the small intestine for a distance of 40 cm. was found packed full of ascarides, but there were no evidences of intestinal obstruction and it is questionable whether this accumulation of the worms, so as apparently to obstruct the gut, is not a post-mortem occurrence.

Sclerostoma Pinguicola (Verrill), believed to be identical with Stephanurus Dentatus (Diesing), although this identity is not absolutely certain. This interesting worm was found in the abdominal adipose tissue and in the liver. As the presence and mode of migration of this parasite in the liver of swine have not hitherto been described, Dr. Welch showed a number of specimens making these points clear. The sclerostoma pinguicola was found in the livers of eleven swine, and, while not very frequent, cannot be considered a rarity in this situation. It is found, often in large numbers, in the main trunk and branches of the portal vein, which then usually contain parietal or occluding thrombi in which the worms are imbedded. The real habitat of the worm is, however, the connective tissue around the portal vessels. In this tissue it burrows its way, producing inflammatory masses of new connective tissue rich in leucocytes. On section of the liver, nodules and bands with sinuous cavities containing a brownish or reddish white purulent fluid are observed. Similar nodules are also visible projecting on the surface of the liver In these sinuous cavities the parasite may be found, or it may be absent, having made its way to other parts. The worm finds its way into the portal vessels by ulceration from the peri-portal tissues through the walls of the vessels, and in several instances the worm could be demonstrated partly within and partly without the vein. Before actual penetration into the vein there occurs a bulging inward of the vessel wall on which forms a thrombus composed primarily of blood plates. One of the most interesting histological changes produced by the invasion of this parasite into the liver is an extensive new growth of the mucous glands in the walls of the bile ducts. This new growth occurs in the areas of newly formed connective tissue in the neighborhood of the parasites. Actual adenomatous formations of undoubted parasitic origin are produced in this way. The same alteration has been recently described and pictured by Schaper in connection with distomatosis of the liver (Deutsche Zeitschrift für Thiermedecin, Bd. XVI, p. 1). On sections of the worms, as found in the liver, leucocytes with well-stained nuclei, resembling those in the fluid of the cavities containing the worms, can be seen in the intestinal canal of the worm, but whether this can be interpreted as evidence that the pus cells produced by the presence of the worm actually serve as its food is uncertain. Sometimes the lesions of the liver, which have been described, were extensive, the surface and interior of the organ presenting a large number of parasitic foci, and it would seem as if such an extent of the disease must be injurious, but no cases were observed in which the death of the animal could be attributed to the presence of the sclerostoma pinguicola. The identity of the parasite as found in the liver and as found in the well known foci in the abdominal fat tissue was demonstrated. Instances in which the main trunk of the portal vein as it enters the liver was completely occluded by a thrombus containing the sclerostomata were exhibited.

Strongylus Paradoxus. This strongyle is extremely frequent in the bronchi of swine in this region. Its presence was found to be the direct cause of death in three pigs. In these cases the trachea and bronchi contained an almost incredible number of strongyles, so that on sections of the lung, the medium-sized and small bronchi appeared filled with worms. The strongylus paradoxus is usually associated with some bronchitis and often with broncho-pneumonia, but it may be present, even in large numbers, without either bronchitis or pneumonia. In fact in one of the fatal cases mentioned in which the strongyles appeared to fill the medium-sized and small bronchi and were present in enormous numbers in the trachea and large bronchi there was no trace of pneumonia and scarcely any bronchitis. The animals suffered from extreme dyspnoea and the heart pulsated so

violently as to be visible at a distance and to communicate its motion to the entire thorax. At the autopsy the right ventricle was hypertrophied. The favorite habitat of the worms when present only in moderate number is in the bronchi in the posterior part of the caudal lobes, and sometimes their number is so small that considerable searching is required to detect them. There is usually a little muco-pus in the bronchi where the strongyles are lodged even when there is no general bronchitis. The adjacent lung parenchyma is often emphysematous or on the other hand it may be simply atelectatic or it may be the seat of a broncho-pneumonia. Frequently there is broncho-pneumonia of the ventral lobes when the worms are to be found only in the posterior parts of the caudal lobes. The broncho-pneumonia associated with the strongylus paradoxus appears as a brownish or grayish red consolidation in which the individual lobules and lobulettes can be felt and seen as nodules. The affected part is not much swollen and there is generally no pleuritic exudation. On microscopical section the air cells contain leucocytes, epithelioid cells, sometimes fibrin and red blood-corpuscles and frequently ova of the strongyles. These ova are often partly or completely enclosed within giant cells. By a combination of Weigert's fibrin stain and picrocarmine very beautiful pictures in which the ova are stained blue and the cells red and yellow with picrocarmine can be obtained. A very instructive lesson in embryology is furnished by the ease with which all stages of development of the ova from the simple cell up to the developed embryo worm can be followed in these preparations.

5. FROM THE DOG:

Taenia Cucumerina. This is by far the most common tapeworm of the dogs used for experiment in the laboratory, being found in 60 per cent. of these animals.

Taenia Serrata. Specimens produced by feeding dogs the cysticerci pisiformes from the rabbit were shown.

Taenia Echinococcus was found only in dogs artificially fed with the echinococcus from the hog.

Eustrongylus Gigas. A specimen of this worm, 95 cm. long, was found free in the peritoneal cavity of a dog and was exhibited. It had been found three times in this situation in dogs used for experiment in the laboratory.

Strongylus or Dochmius Trigonocephalus (*Uncinaria Trigonocephala*) was found in the small intestine of 70 per cent. of the dogs used in the laboratory, a much larger proportion than has hitherto been observed. The head of the worm was often found imbedded in the mucous membrane and surrounded by a small extravasation of blood. Sometimes scanty, it was in many cases found in large numbers. Positive evidence that the parasite was the cause of anæmia in the animals could not be found. It was occasionally met with in the stomach as well as in the small intestine.

Tricocephalus Depressiusculus appears to be a constant inhabitant of the dog's coecum.

Ascaris Marginata (doubtless a variety of Ascaris mystax) was found in only a few cases. It was found both in the stomach and small intestine.

The *filaria immitis* was not met with in any of the dogs used in the pathological laboratory and is not common in this region. It, however, occurs here as it has been observed occasionally in the Biological Laboratory of the Johns Hopkins University.

6. FROM THE RABBIT:

Coccidium Oviforme was present in the liver of one-third of the rabbits used for experiment in the laboratory. Coccidia are also common in the intestines of rabbits. Attention was called to the existence of small, opaque, grayish-white patches, suggesting somewhat a superficial necrosis, on the surface of the mucous membrane of the small and the large intestine. These patches contain large numbers of coccidia, often enclosed in epithelial cells.

Cysticercus Pisiformis is common in the peritoneal cavity. Specimens were shown illustrating the nodules and scars caused by the migration of this parasite through the rabbit's liver.

From the rat and cat were shown respectively the *cysticercus fasciolaris* in the liver and the *taenia crassicollis* in the intestine.

No instance of distoma in the animals examined was discovered and in general distomatosis of domestic animals appears to be rare in this region. Through the kindness of Prof. Brooks, Dr. Welch was in the possession of a number of living water snails, many of which were infested with cercaria and living specimens of these interesting forms in the life history of distoma were exhibited under the microscope. These snails were obtained in the neighborhood of Baltimore, so that opportunity for infection with distomata is present here.

REPORT OF DR. WELCH'S REMARKS ON THE DIPLOCOCCUS PNEUMONIAE AT THE MEETING OF THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY, ON FEBRUARY 17TH, 1890.

Dr. William H. Welch reported results of his bacteriological examinations of cases of acute croupous pneumonia, and exhibited cultures and microscopical specimens of the micro-organisms found in these cases. In all of the cases examined, ten in number, the Diplococcus Pneumoniæ was found and isolated in pure culture. This organism is probably constantly present in croupous pneumonia, and the evidence that it is the specific cause of this disease is very strong. In the cases examined by Dr. Welch, roll cultures or plate cultures were made from the affected parts of the lungs, from the spleen, from complicating lesions and frequently from the blood and other situations. Nutrient agar, glycerine agar and gelatine agar, according to Guarnieri's formula, were the media usually employed for this purpose. The growth of the pneumo-coccus on the last named medium is particularly luxuriant. In addition mice and rabbits were inoculated with bits of hepatized lung, with the spleen, etc. In one instance the presence of the pneumococcus would have been overlooked in consequence of the prevalence of other organisms, if the precaution had not been taken to inoculate animals with the tissues. Dr. Welch expressed the opinion that the diplococcus pneumoniæ could not be said to be absent simply on the ground of negative results from cultures. This result must be controlled by the inoculation of susceptible animals. Moreover, even the failure to kill mice and rabbits by inoculation can not be considered conclusive evidence of the absence of the diplococcus pneumoniæ, for this organism may be present in the human body in cases of croupous pneumonia in a form incapable of killing rabbits or even mice.

One of the most interesting and extraordinary properties of this organism is the variation in its virulence when tested upon animals. All who have experimented with cultures of the diplococcus pneumoniæ have called attention to its rapid loss of virulence when cultivated in artificial media. It is important to note that a progressive diminution of virulence may occur likewise in the lungs and other organs where the pneumo-coccus is present in cases of croupous pneumonia. In one case of croupous pneumonia dying in the stage of grey hepatization Dr. Welch found very numerous colonies of the diplococcus pneumoniæ, mixed with a few colonies of the staphylococcus aureus in agar plate cultures from the consolidated lung. A rabbit inoculated with a piece of the lung died on the fifth day with extensive local reaction and large spleen. The pneumo-cocci were abundant near the seat of inoculation, and were found in considerable number, although fewer than usual, in the blood. Plate cultures (agar) made from the swollen spleen (after burning thoroughly the surface) of this patient showed in very large number, colonies of the pneumo-coccus. No other species of organism was present in these cultures from the spleen. The same pneumo-coccus was likewise observed in cover-glass preparations from the fresh spleen. The organism isolated from the spleen conformed in every particular as regards its morphology, its behavior in artificial culture media, its short vitality, its color-reactions to the pneumo-coccus found in the lung, the so-called Fraenkel-Weichselbaum pneumo-coccus. Nevertheless it was devoid of its customary virulence, for a mouse and a rabbit inoculated subcutaneously with a bit of the spleen survived, and mice and rabbits inoculated with pure cultures of the organism likewise survived, the only reaction being a small abscess or purulent infiltration of the tissues at the point of inoculation. In this case, therefore, the diplococcus pneumoniæ was present in large numbers in the hepatized lung in a weakened state as regards its virulence, and in the spleen in a condition incapable of killing rabbits and even mice. Every grade of virulence was observed in the pneumo-cocci found in the

different cases, from the degree just described as incapable of killing mice and rabbits up to the degree in which rabbits were killed in 36 to 48 hours by an acute septicæmia. In two cases the pneumo-coccus did not kill rabbits but it did kill mice, so that the latter animals are more susceptible and are to be preferred for inoculating tissues in cases of croupous pneumonia. In three cases rabbits survived the inoculation for more than five days, the longest duration being twelve days. Inoculation of rabbits with exudation present in the bronchi or in the trachea sometimes caused a rapidly fatal sputum-septicæmia even when the pneumo-coccus present in the hepatized lung showed weakened virulence. In general the impression was obtained that the most virulent forms of pneumo-cocci are to be found in the sputum, in the freshly hepatized lung or at the margin of an advancing pneumonia, whereas the pneumo-cocci present in advanced stages of hepatization and in the spleen are likely to be less virulent. This progressive diminution in virulence, as tested upon animals, of the pneumo-coccus in the consolidated lung and other organs in cases of croupous pneumonia is surely a significant circumstance. In no instance had Dr. Welch as yet been able to isolate the pneumo-coccus in a state capable of producing pneumonia in dogs, although not less than 5 cc. of a bouillon culture 24 hours old (in the thermostat at 37° C.) of the pneumo-coccus, obtained from a rabbit dead 40 hours after inoculation, had been injected directly into the lung. Other observers, however, had obtained positive results by this method of inoculation. Others have found pneumo-cocci producing more rapidly fatal septicæmia in rabbits than resulted from any of the cultures obtained from the cases examined by Dr. Welch.

In six of the ten cases the diplococcus pneumoniæ was found in pure culture in the hepatized lung as determined by microscopical examination and by plate or roll agar cultures; in two cases it was present in combination with the staphylococcus pyogenes aureus; in one case, in addition to the pus staphylococci, the streptococcus pyogenes was present in considerable number; and in one case with gangrenous foci there were present, besides the diplococcus pneumoniæ and the pus staphylococci, a short oval bacillus and a long slender bacillus not developing in plate cultures (aerobic cultures). In one of the cases in which the staphylococcus pyogenes aureus was present, several small abscesses had formed in the hepatized lung. In four cases the diplococcus pneumoniæ was found in pure culture in the spleen, which in all of these instances was swollen and soft; in one case it was isolated from the kidney and in one from the heart's blood. In all instances (five) in which the pleuritic exudate accompanying acute croupous pneumonia was examined by culture methods, the diplococcus pneumoniæ was found in this exudate. In three cases of empyaema following acute croupous pneumonia (these do not belong to the ten cases now under consideration) the diplococcus pneumoniæ was found; in two in pure culture, in one in combination with staphylococcus pyogenes aureus and albus. The pneumo-bacillus of Friedländer was not found in any case.

Dr. Welch described the morphology and behavior in culture media of the diplococcus pneumoniæ. He had found that a convenient way of staining the capsules was to treat the cover glass specimens, dried and treated in the usual way, with glacial acetic acid and then without washing off the acid to drop on the cover glass aniline-oil gentian-violet, which can be allowed to drain off and can be renewed two or three times. Attention was called to broad pale rods corresponding to empty capsules sometimes found in the fluid of empyaema following pneumonia. These may be 10–30 mm. long and 2–3 mm. broad. They stain faintly, may be entirely empty or may contain one or more deeply stained pneumo-cocci. They correspond to the capsular substance around rows of pneumo-cocci, the cocci having partly or wholly disappeared.

For staining sections, Weigert's fibrin stain had given most excellent results. A method which had yielded good and quick results was to dry thin frozen sections from the fresh organs upon the slide and then to heat them for half an hour at a temperature of 110° to 115° C. These can then be stained like cover-glass specimens. This method is often employed in the laboratory for staining fresh tissues in general for micro-organisms.

The statements of Fraenkel and others were confirmed as to the behavior of the diplococcus pneumoniæ in artificial culture media, its susceptibility to slight changes in the reaction and composition of the medium, its brief vitality, etc. As already mentioned, Guarnieri's gelatine-agar medium was found to be particularly suitable.

The history of our knowledge of this organism from its discovery by Sternberg in September, 1880, up to the present time and the results and conclusions reached by the various investigators of its relation to croupous pneumonia were briefly reviewed. The frequent presence of the pneumo-coccus in the saliva of healthy persons is upon the whole an assistance to us in the explanation of the various factors concerned in the causation of croupous pneumonia.

NOTES ON NEW BOOKS.

A Text Book of Pathology, Systematic and Practical, by D. J. Hamilton, B. M., F. R. C. S. E., F. R. S. E., Professor of Pathological Anatomy, University of Aberdeen. (*Macmillan & Co., London and New York*, 1889.)

The first 157 pages of this book are devoted to technic. This includes methods of making post-mortem examinations, hardening and preparing tissues for examination and the various methods used in the study of bacteria. This portion of the book is good. The methods given for post-mortem examinations differ in some respects from those in use in Germany but they are simple and easily followed. Complete instructions are given for the hardening and examination of the brain and for making large macroscopic sections. The author particularly recommends the study of brain lesions after hardening the organ. While it is true that in this way the exact relation of parts is better preserved, the nature of the lesions is not so clear and there is the further disadvantage of the examination being made when the history of the case and the lesions in other parts are not fresh in the mind.

Part II comprises general pathological processes. The degenerations are not treated as extensively as we might wish. The amyloid change in organs is placed under the Infiltrations where it properly belongs instead of being included with the Degenerations as is done in most books on pathological anatomy. Some of the phenomena of inflammation are treated very fully, while but little attention is paid to others equally important. Twenty pages are taken up with an account of the author's experiments on the circulation of water, with objects of different specific gravity suspended in it, in glass tubes. These experiments, though ingenious, do not warrant the conclusion which is drawn from them, that the sole cause of the relative position of the white and red corpuscles in the vessels is the difference in their specific gravity. Some statements are directly misleading. On page 235 the inflammation which the author has observed around bland fat emboli in the lungs, is explained simply by the mechanical effect of the stoppage of the vessels. Not one word is said about the necrosis. Still more strange is a statement on the next page. In speaking of the inflammatory exudation, he says: "The exudation is poured out in a liquid form and tends to gravitate to the lowest part of a hollow organ like the lung. Hence probably the greater frequency of consolidation at the base of the lung in croupous pneumonia than at the apex." At the close of the article on inflammation sponge-grafting is recommended in the treatment of ulcers, and exact methods are given for treating and applying the strips of sponge. The utility of sponge-grafting may be disputed and a text book on pathology is hardly the place to advocate a therapeutic procedure. On page 267 we find the following, which looked better in a book published fifteen years ago than in one bearing the date of '89. "Inflammatory effusions in persons with a strumous habit of body have a great tendency after suppurating to dry and caseate. Such may become fertile sources of tuberculosis." It is depressing to find such a statement after all the work which has been done on tuberculosis in the last ten years. Very little space is given to the consideration of tumors and the descriptions of the different varieties are meagre and unsatisfactory. The description of tubercle which is properly treated under "Tumors due to a micro-organism" is especially unsatisfactory. In the anatomical description of its structure no mention at all is made of the epithelioid cell, which is the first to appear and the first in importance of all the cells which enter into its composition. The word *seems* is used too often. Scrofula does not exist anatomically. It ought not to be said by a pathologist that "experiments seem to show that tubercle and scrofula are alike." The remainder of the book is given to the pathology of the blood and blood vessels. The anatomical descriptions here are not good and some of the statements erroneous. In general the illustrations of pathological histology are not good. It is to be regretted that the English system of weights and measures is adhered to throughout.

W. T. C.

AN ELECTRIC APPARATUS USED IN THE DIAGNOSIS OF DISEASES OF THE NERVOUS SYSTEM.

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Before presenting the battery to you, I take the liberty of making a few remarks regarding the requirements of a battery which is to be used in the diagnosis and treatment of diseases of the nervous system.

Whatever may be thought as to the therapeutic value of electricity, there can be no doubt that it is an essential factor in the diagnosis and prognosis of many diseases of the nervous system. By it we recognize and determine changes in the excitability of nerves and muscles, and from their reactions to it we are able to say, this nerve is degenerated, that muscle is not.

In many cases of paralysis due to injury of nerves we are able, being guided by the electrical reactions, to give a fairly definite prognosis as to the time when the patient may look for a return of power in the affected muscles.

Two forms of electricity are used in diagnosis, the induced or interrupted current, commonly called the faradic; and the galvanic or constant current. Nerves and muscles under various conditions respond differently to these two currents, and our apparatus must furnish both.

We not only have to determine that this or that nerve or muscle responds to the faradic or galvanic current, but we must also know just how strong a current of each is required to bring out the smallest visible contraction and how strong to cause a tetanic contraction, etc. Our apparatus must be so arranged that we can vary and estimate the strength of the currents used.

Nor is this all; for it has been shown that the strength of the electrical stimulus varies not only with the strength of the current, but also with its density; and as the density of the current under the exciting electrode depends upon the square surface of that electrode, we must have electrodes of known square surfaces. Finally as the electrical excitability of nerves and muscles to the galvanic current differs according as the exciting electrode is positive or negative, and as the current is made or broken, we must be able to reverse the current, and to make and break it.

Any one who has made electrical examinations knows that under the very best conditions it is a tedious and tiresome undertaking, and will agree that the apparatus should be made as simple and convenient as possible.

An electrical apparatus which is to be used in the wards of a hospital must be so contrived that it can be brought to the bedside of any patient, and it must contain everything that is necessary for an accurate examination.

Two methods were considered in connection with this Hospital. The first was to have a large battery composed of storage cells, situated at some central point, and connected with all the wards by wires, so arranged that a table, bearing the necessary apparatus could be brought into the circuit at any desired place. This, although attractive, was found to be very expensive, and not simple enough.

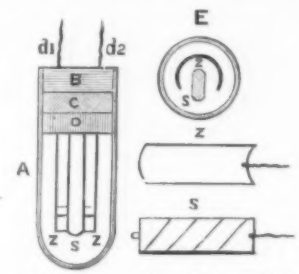
The other plan, and the one which has been adopted, was to construct an apparatus which could be easily moved from place to place and which should contain all the necessary appliances, as well as the battery itself.

There is nothing especially novel in this plan, as it differs only in detail from that which is adopted in most hospitals. We were, however, peculiarly fortunate in having the assistance of Dr. G. A. Liebig of the University and Mr. Charles Willms, of this city. These gentlemen spared no pains in putting our ideas into a thoroughly scientific and practical shape, and I take pleasure in presenting in evidence thereof the apparatus which is now in daily use in the wards.

In the construction of such an apparatus, the most important practical point is the kind of galvanic cell used to furnish the electrical current.

To furnish a current of sufficient strength the battery must be composed of a large number of cells. In this apparatus there are 100, and as the battery is portable, the size, weight and construction of the cells is of the first importance. If they are large and heavy the battery becomes clumsy and practically stationary. Those cells which contain fluid are dirty and troublesome. So other things being equal, the smaller, lighter and drier a cell is the better.

The cell which meets all these requirements far better than any other known to me is the dry chloride of silver cell, as now manufactured by the John A. Barret Battery Co. This cell is composed of a rod of fused chloride of silver (*S*) and a plate of zinc (*Z*) immersed in a paste saturated with sulphate of zinc. The cell is very tightly sealed and when complete measures 2¾ in. high and ¾ in. in diameter.



The advantages of this cell are that it is small, light, perfectly clean, always ready for use, and that it has an electro-motive force (one volt) which remains constant during its entire life.

It may not be out of place here to recall the fundamental law which determines the strength of a current from such a cell. It is called Ohm's law and is as follows: The current is equal to the electro-motive force of the cell, divided by the resistance of the circuit, and is written $C = \frac{E}{R+r}$, where C is the current, E the electro-motive force, R the external resistance, and r the resistance of the cell itself.

Now the electro-motive force depends solely upon the nature of the metals used, and on their temperature, and is affected in no way by their size.

The resistance which a conductor offers to the flow of an electric current depends upon its nature and is directly proportionate to its length, and inversely to its square surface; or, applied to the internal resistance of a cell, this is greater, the smaller the plates and the greater the distance which separates them.

Here it is evident that the size of the cell may make a great difference in the strength of the current, for if in the formula $C = \frac{E}{R+r}$, the external resistance R is very small when compared to the internal resistance r, we can increase the current very materially by decreasing the internal resistance. And indeed if R is to be disregarded, this is the only way we can increase the current strength; for by increasing the number of cells, we simply multiply the numerator and the denominator of the fraction by the same factor.

This is the condition that has to be met in batteries designed for electro-cautery work, where the external resistance is small, and so in these batteries we have a few very large cells.

But in the diagnosis and treatment of diseases of the nervous system where the current is passed through the body, and its resistance, which is very great indeed, makes the only essential part of the external resistance, the conditions are reversed, and R is so large in comparison to r that the resistance of the cell itself may be disregarded to a very great extent, and here we depend not upon the size of the cells but upon their number. From this it is evident that the little chloride of silver cells answer our purpose perfectly, provided we have a sufficient number. By the passage of the current through the cell, the chloride of silver is reduced to metallic silver, and this change is directly proportional to the current; that is, if a very strong current is passed through the cell, the reduction goes on very rapidly, and the cell is worked out in a short time. For this reason, in using these cells, care must be taken not to short-circuit the battery, that is, close the current with little or no external resistance; for if through carelessness this were done, the battery would be ruined in a night. This is the one disadvantage these cells have.

The life of the battery depends entirely upon the current used, and the electro-motive force is said to remain constant until all the chloride of silver is reduced.

There are one hundred cells in the constant current of this battery, arranged so that ten cells can be brought into the circuit at one time.

As has been said, it is of very great importance to know just how much current we are using, so we have introduced into the current a galvanometer, which is calibrated to read in milliampères, or in other words, it is an absolute galvanometer.

We can with any given number of cells change the strength of the current by introducing more or less resistance. This is done in the ward battery by passing the current through a water rheostat, in which we can vary the distance through which the current has to pass in the water.

In regard to the induction apparatus, I shall only say a few words, as the principle which governs it is well known. It is composed of a primary and secondary coil. The primary coil is in the circuit of a battery composed of a few chloride of silver cells. Into this circuit is introduced an electro-magnetic interrupter, which makes and breaks the current very rapidly. The secondary coil is so constructed that it can be freely moved over the primary coil. Every time the current is made or broken in the primary coil a current is induced in the secondary coil, and this induced current is the one which is used in diagnosis. The strength of the current in any induction apparatus depends upon the strength of the current passing through the primary coil, the rapidity with which that current is made and broken, and upon the distance of the primary from the secondary coil.

We endeavor to keep the first two factors constant and speak of the current as stronger or weaker depending on the distance of the coils.

The scale on this apparatus is relative, *i. e.*, the strongest current which can be obtained from it is taken as 100, and the other numbers on the scale represent relative current strengths.

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CONTENTS.

	PAGE.
Courses of Instruction for Graduates in Medicine, 1890–91,	65–67
The Treatment of Yellow Fever with Sodium Bicarbonate and Mercuric Chloride. By GEORGE M. STERNBERG,	68
Stomach Washing in Children. By WM. D. BOOKER,	69–71
Report of Dr. Welch's Remarks and Exhibition of Specimens of Animal Parasites at the meeting of the Johns Hopkins Medical Society,	72–73
Report of Dr. Welch's Remarks on the Diplococcus Pneumoniae at the meeting of the Johns Hopkins Hospital Medical Society,	73
Notes on New Books,	74
An Electric Apparatus used in the Diagnosis of Diseases of the Nervous System. By H. M. THOMAS,	75
Publications of the Johns Hopkins Hospital,	76

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